

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Siaw Teck SANG et al
Application No.: 10/773,451
Filed: February 9, 2004
Title : METALLIZED MULTILAYER FILM

Examiner: K.R. Kruer
Group Art Unit 1794

RULE 132 DECLARATION OF DR. FABRICE CHOPINEZ

I, Fabrice Chopinez, hereby declare and state that:

1. I hold a MSc degree in polymer and composites engineering from the Ecole nationale Supérieure des Mines de Douai (France), an MSc degree in Organic and macromolecular chemistry from the University of Lille (France) and a PhD in materials engineering from the Ecole nationale Supérieure des Mines de Paris.

From 2001 to 2006, I've been working for Arkema as a research projects team leader in the technical Polymers business Unit. Since 2007, I'm market development manager for the functional polyolefins department of Arkema.

I have extensive experience in the field of functional polyolefins and use of these polyolefins in packaging applications.

2. I have reviewed the patent application of the reference above, the action sent by the USPTO on January 11 2010 and the prior art cited in this office action.

The testings disclosed further in my declaration show the differences between the claimed invention and the prior art.

3 Material preparation :

3.1. Grafted materials (grafted blend C):

The following three grafted materials have been prepared on a Leistritz corotative twin screw Extruder :

Graft reference :	Resin 1		Resin 2		Introduced Maleic Anhydride % wt	Introduced DHBP % wt	Maleic Anhydride grafted %wt
	reference	% wt	Reference	% wt			
Graft 1	mPE 1	99,305%			0,65%	0,045%	0,55%
Graft 2	PP1	98,83%			0,9%	0,27%	0,56%
Graft 3	mPE1	79,4%	PP1	19,85%	0,7%	0,05%	0,53%

mPE1 : metallocene Polyethylene, density 0,902 (Dow, Elite 1880G)

PP1 : Homopolymer PP, Borealis HD214CF

Base resins (granules) and maleic anhydride (solid state) are introduced in the first zone of the extruder by the mean of a weight dosing unit.

2,5 dimethyl-2,5 (ditertiobutyl) hexane peroxide (DHBP) is introduced in the liquid state by the mean of a dosing pump on the second zone of the extruder. Non reacted monomers and peroxide residues are degazed under vacuum in the 6th zone of the extruder.

Temperature profile along the extruder is :

Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8
190	190	200	230	240	240	230	230

output : 10 Kg/h

Grafted polymers are extruded as rod, cooled in a water bath and then cut into cylindrical granules. The %wt of maleic anhydride grafted on 3 different polymers is around 0,55%.

3.2 Blends (A) :

The previous grafted polymers (C) have been used to compound the following blends (A) :

Blend 1 : 60%wt Graft1 + 40%wt mPE2 (D)

Blend 2 : 60%wt Graft2 + 40%wt mPE2 (D)

Blend 3 : 60%wt Graft3 + 40%wt mPE2 (D)

Blend 4 : (48%wt Graft1 + 12%wt Graft2 + 40%wt mPE2 (D)

with mPE2 : metallocene Polyethylene, density 0,91 (Exxon, Exact 2MO65)

All blends have been produced on the same Leistritz twin screw extruder used for the preparation of Grafted materials. All base resins are introduced in a separate weight dosing unit in the first zone of the extruder. The temperature profile is the same than the one used for the preparation of Grafted materials.

Output : 15 Kg/h

The Blends 3 and 4 are the same except that mPE1 and PP1 were simultaneously co-grafted by maleic anhydride in Blend 3, whereas mPE1 and PP1 were separately grafted in Blend 4.

4. Film production :

Four cast polypropylene (cPP) films have been produced on a 5 layer (using 3 extruders) Dr collin Cast line.

The structure of the cPP is as followed:

metallizable layer / PP1 Core layer / PP2 sealing layer		
3 µm	17µm	5µm

PP2 is a PP terpolymer : Borseal TD120BF from Borealis (Melt Index 6,5).

Four metallizable layer compositions have been tested to produce the different structures:

25% Blend 1 + 75% PP1 (B)

25% Blend 2 + 75% PP1 (B)

25% Blend 3 + 75% PP1 (B)

25% Blend 4 + 75% PP1 (B)

cPP films have been metallized by the final customer according usual metallization (thickness of metal about 25nm) and cPP were glue laminated to a printed bi oriented PP (BoPP) film using glue lamination procedures.

The final structure is then :

BoPP / print / glue / metallized layer / PP1 Core layer / PP2 sealing layer
About 20µm / 3 µm 17µm 5µm

5. Material testings

The above final structure has been sealed to form a pouch. 15mm width samples including the sealing layers have been then cut and the sealing strength has been tested (peel test) one month after the sealing.

Haze has been measured on the non metallized cPP films. Haziness is a critical point for these films, as it is related to the gloss of the metallized film, a property which is essential for metallized films manufacturers: the lower the haze is, the glossier the metallized film is.

Results are included in the following table :

sample	metallized layer composition				haze (%)	peel strength (g/15mm), measured one month after sealing
	C	D	B			
1	grafted mPE1				17,3	198
2	grafted PP1				4,5	54
3	grafted (80% mPE1 + 20% PP1)	15% mPE2	10% PP2	75%	5,2	185
4	80% grafted mPE1 + 20% grafted PP1				14,4	149

These results show the haze of the two metallizable layer compositions of sample 3 and 4 are different.

It has to be noted that the only difference between metallizable layer composition used in sample 3 and 4 is the nature of the Graft polymer (C): it is respectively a co-grafted blend of mPE and PP in the case of sample 3 and a blend of grafted mPE and grafted PP in the case of sample 4.

Thus, it is concluded that a co-grafted blend of mPE and PP is clearly different from a blend of grafted mPE and grafted PP.

These results also show that sample 1 comprising grafted mPE1 has an excellent adhesion in the metallized PP film but the haze is high. Sample 2 with grafted PP1 is very transparent (low haze) but the adhesion is poor. Sample 4 which comprises a blend of grafted PP and grafted mPE has a fairly good adhesion but the haze remains high.

The cografted composition (composition of the invention) used in sample 3 unexpectedly led to the best compromise with both a very good adhesion a low haze level.

The metallized films of the invention have improved adhesion between the polypropylene layer and the metal layer and better gloss properties. This was unexpected from the prior art.

6. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Fabrice Chopinez

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May 7th 2010

Date